

U.S.S.N. 10/038,800

REMARKS

Thorough examination and careful review of the application by the Examiner is noted and appreciated.

Claims 1-15 are pending in the application. Claims 1-15 stand rejected.

Claim Rejections Under 35 USC §103

Claims 1-6 and 8-15 are rejected under 35 USC §103(a) as being unpatentable over Shields '646 publication in view of Suzuki '459.

The rejection of claims 1-6 and 8-15 under 35 USC §103(a) based on Shields and Suzuki is respectfully traversed.

Shields discloses a silicon oxynitride anti-reflective coating for metal patterning in which a silicon oxynitride ARC/hard mask is formed on a metal layer and patterned, avoiding a separate hard mask. In the Shields' process, a **thin silicon oxide** layer is formed on top of the silicon oxynitride layer in order to improve resistance to footing. As stated at page 3, left column, lines 6-8:

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"Silicon oxide layer 36 can be formed at a thickness of about 20 angstrom to about 300 angstrom without significantly increase the height of the stack".

The Applicants respectfully submit that Shields teaches a completely different process of forming metal lines when compared to the present invention process of forming a deep via with large aspect ratio in a silicon oxide layer. For instance, at page 14 of the specification, lines 15+:

"As shown in Figure 3, the depth of the via openings 40, shown as "L_v" is measured to be 639 μ m, which represents a 40% improvement over that obtained by the conventional method shown in Figure 2".

The thickness of the silicon oxide layer, into which the deep via opening is formed, is therefore at least 6400 angstrom, when compared to the silicon oxide layer of Shields at 20-300 angstroms. Shields therefore does not teach the present invention process of forming a deep via with high aspect ratios. As a matter of fact, Shields not only does not teach a method for forming a deep via, or for that matter, a method for forming a via at all, it

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is simply impossible to form any kind of via in the Shields structure. While the Examiner contended at page 3 of the 12/12/2003 Office Action that Shields provides a "stack" that has a total height of about 13,000 angstroms, the height is mainly made up of a photoresist layer (900 angstrom), a barrier metal layer (750 angstrom) and a metal layer (8,000 angstrom), it is simply impossible to form an electrically conductive via in these layers. A via can only be formed in a dielectric or insulating material layer such as that of silicon oxide, normally known as inter-metal dielectric layer. The silicon oxide layer taught by Shields has a thickness of about 20 - 300 angstrom such that it is simply out of the question that a via can be formed in such an oxide layer. The Applicants further submit that while Suzuki teaches curing a photoresist with UV radiation, Suzuki does not lend any additional weight in a §103 rejection of claims 1-6 and 8-15 since the basic deep via forming process is not taught by either Shields or Suzuki, either singularly or in combination thereof.

The rejection of claims 1-6 and 8-15 under 35 USC §103 (a) based on Shields and Suzuki is respectfully traversed. A reconsideration for allowance of these claims is respectfully requested of the Examiner.

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Claim 7 is rejected under 35 USC §103(a) as being unpatentable over Shields, Suzuki and further in view of Hsia '724. It is contended that Hsia teaches that in a conventional metallization process, it is known that a chemical compound film will be formed on the metal layer during the etching process as a result of a reaction between the hydrocarbon polymers of the photoresist and the chlorine or fluorine molecules contained in the reactive ion etching chemicals.

The rejection of claim 7 under 35 USC §103(a) based on Shields, Suzuki and Hsia is respectfully traversed.

Claim 7 depends on independent claim 1, which the Applicants have clearly shown is not taught by the two primary references of Shields and Suzuki. The Applicants further submit that the additional reference of Hsia does not lend any additional weight in a §103 rejection, since Hsia does not teach the forming of a via at all.

The rejection of claim 7 under 35 USC §103(a) based on Shields, Suzuki and Hsia is respectfully traversed. A reconsideration for allowance of these claims is respectfully requested of the Examiner.

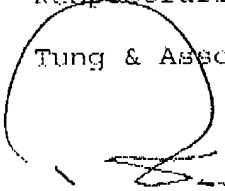
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Based on the foregoing, the Applicants respectfully submit that all of the pending claims, i.e. claims 1-15, are now in condition for allowance. Such favorable action by the Examiner at an early date is respectfully solicited.

In the event that the present invention is not in a condition for allowance for any other reasons, the Examiner is respectfully invited to call the Applicants' representative at his Bloomfield Hills, Michigan office at (248) 540-4040 such that necessary action may be taken to place the application in a condition for allowance.

Respectfully submitted,

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